CLAIMS:

1. A magnetoelectric element including at least one set of alternative piezoelectric layer and magnetostrictive composite layer, wherein:
   - the magnetostrictive composite layer includes at least one magnetostrictive material dispersed in first concentrated zones within a first polymer matrix, wherein all of said concentrated zones are orientated along a first direction.

2. The magnetoelectric element of Claim 1, wherein the magnetostrictive material is a rare-earth-based alloy.

3. The magnetoelectric element of Claim 2, wherein the rare-earth-based alloy is selected from the group consisting of terbium-dysprosium-iron alloy (Terfenol-D), gallium-iron alloy (Gafenol) and samarium-dysprosium-iron alloy (Samfenol-D).

4. The magnetoelectric element of Claim 1, wherein the first polymer matrix is made of a first polymer selected from the group consisting of thermosetting polymer and thermoplastic polymer.

5. The magnetoelectric element of Claim 1, wherein the piezoelectric layer is selected from the group consisting of piezoelectric polymer and piezoelectric composite.

6. The magnetoelectric element of Claim 5, wherein the piezoelectric polymer is selected from the group consisting of polyvinylidene fluoride (PVDF) polymer, and polyvinylidene fluoride-trifluoroethylene [P(VDF-TrFE)] copolymers.

7. The magnetoelectric element of Claim 5, wherein the piezoelectric composite includes at least one piezoelectric material dispersed in second concentrated zones within a

second polymer matrix, wherein all of said concentrated zones are orientated along a second direction.

8. The magnetoelectric element of Claim 7, wherein the piezoelectric material is selected from the group consisting of barium titanate ($BaTiO_3$), lead zirconate titanate (PZT), lead magnesium niobate-lead titanate (PMN-PT) and lead zirconate niobate-lead titanate (PZN-PT).

9. The magnetoelectric element of Claim 7, wherein the second polymer matrix is made of a second polymer selected from the group consisting of thermosetting polymer, thermoplastic polymer, polyvinylidene fluoride (PVDF) polymer and polyvinylidene fluoride-trifluoroethylene [P(VDF-TrFE)] copolymer.

10. A magnetoelectric device including:

- at least one magnetoelectric element according to any one of Claim 1 to 9; and
- a least one field generator for generating a magnetic field

such that the magnetoelectric element is positioned in the magnetic field.

11. The magnetoelectric device of Claim 10, wherein the field generator is an invariable field generator.

12. The magnetoelectric device of Claim 11 further including a second variable field generator to generate a variable magnetic control field.

13. The magnetoelectric device of Claim 10, wherein the field generator is a variable field generator to generate a variable magnetic control field.

14. A method of controlling at least the magnetoelectric voltage coefficient α_E of a magnetoelectric device including a magnetoelectric element, said magnetoelectric element including at least one set of alternative piezoelectric layer and magnetostrictive composite layer, wherein:

- the magnetostrictive composite layer includes at least one magnetostrictive material dispersed in first concentrated zones within a first polymer matrix, wherein all of said concentrated zones are orientated along a first direction; and
- positioned in a magnetic field generated by a variable field generator

including the step of varying the magnetic field.

15. The method of Claim 14, wherein the magnetoelectric device has a resonance frequency region, and the magnetic field is varied within the resonance frequency region.

16. The method of Claim 14, wherein the resonance frequency region is about 45 to 85 kHz.